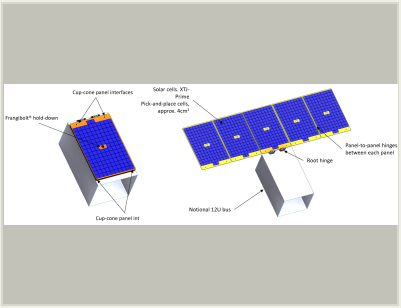
# High Watts Per Kilogram - Advanced Integration and Heat Management Solar Array Technology (HaWK-AIHM ), Phase I

Completed Technology Project (2017 - 2017)

## Project Introduction

Small satellite architectures have become a desirable low cost alternative to larger heritage spacecraft for advanced scientific missions. Unfortunately, the traditional component make-up of a small satellite or cubesats is for short duration missions and not specifically designed for space environment resiliency. NASA has identified several scientific missions which would benefit from highly engineered, space environment tolerant and high reliability components. MMA Design (MMA) proposes new innovations in small satellite deployable solar arrays for theses missions, specifically targeting high reliability, simple and heritage proven designs, and high performance. • Composite deployable hinge mechanism - due to volumetric constraints and stowed thickness requirements, an innovative composite panel-to-panel hinge mechanism is required. MMA has extensive knowledge in the design, manufacturing and test of composite tape hinges for deployable structures. The challenges that will be addressed in this effort is how to design a composite hinge with a tight stowed radius of curvature and a method of integration to the substrate panels that provides higher thermal conductivity than a traditional clevis hinge. • Advance high stiffness, high-k solar array substrates, multi-functional - limitations with traditional polyimide or glass-fiber substrates is that they exhibit low stiffness and thermal conductivity properties. Alternatively, High-K Mesophase-pitch based graphite fibers would provide magnitudes higher thermal conductivity, thus providing better heat transfer throughout the solar array panel. Also proposed are innovations in co-cured substrate construction whereby a highly emissive film is cured directly into the substrate panel creating a surface for significant heat rejection a on the backside of the solar array. The front side of the panel will also include a cured in circuit trace, which will significantly reduce wiring routing on the solar panel.




High Watts per Kilogram - Advanced Integration and Heat Management solar array technology (HaWK-AIHM ), Phase I Briefing Chart Image

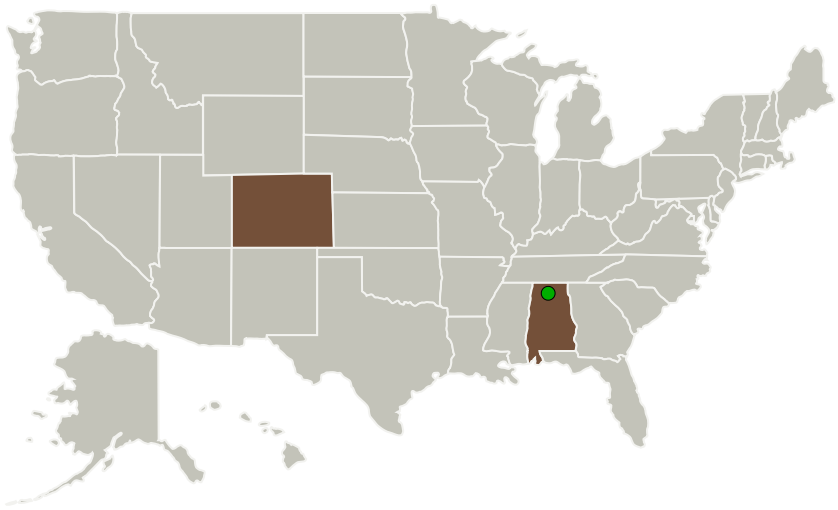
## Table of Contents

**Small Business Innovation Research/Small Business Tech Transfer**

# High Watts Per Kilogram - Advanced Integration and Heat Management Solar Array Technology (HaWK-AIHM ), Phase I

Completed Technology Project (2017 - 2017)

## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| MMA Design LLC | Lead Organization | Industry | Loveland, Colorado |
| Marshall Space Flight Center(MSFC) | Supporting Organization | NASA Center | Huntsville, Alabama |

| Primary U.S. Work Locations | |
|---|---|
| Alabama | Colorado |

## Project Transitions

**June 2017:** Project Start

**December 2017:** Closed out

**Closeout Documentation:**

- Final Summary Chart*(https://techport.nasa.gov/file/140831)*

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

MMA Design LLC

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

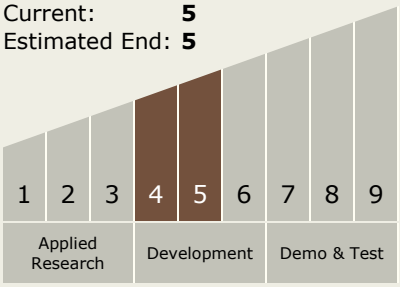
Carlos Torrez

**Principal Investigator:**

Eric Mcnaul

## Technology Maturity (TRL)

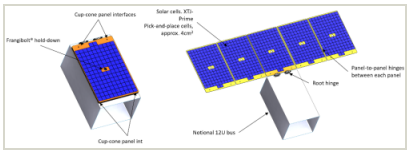
Start: **4**
Current: **5**
Estimated End: **5**



# High Watts Per Kilogram - Advanced Integration and Heat Management Solar Array Technology (HaWK-AIHM ), Phase I

Completed Technology Project (2017 - 2017)

## Images



**Briefing Chart Image**
High Watts per Kilogram - Advanced Integration and Heat Management solar array technology (HaWK-AIHM ), Phase I Briefing Chart Image *(https://techport.nasa.gov/image/135132)*

## Technology Areas

**Primary:**

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.1 Photovoltaic

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System